structures they would be placed in different groups, the one being normal though often varying, the other only occasional, they are on the same footing for the purposes of this argument. It is known to be a vestige of the structure joining the intestine by which, at an early stage of the evolution of the animal frame, nourishment is introduced. All trace of it usually disappears, but occasionally part of it remains as a pouch opening from the small intestine. It has the usual coats of intestine, the inner coat presenting the same food-absorbing villi. It is therefore acting, but no one will argue that it is designed for use in those comparatively few persons who possess it. Unfortunately it is sometimes the cause of death. The author had met with cases of this, and it is well known to surgeons. It may be unable to expel its contents; or by adhering to a neighbouring part a noose is formed, a most dangerous condition, a sort of bowel-trap, through which a knuckle of intestine slips, and strangulation, followed by death, is the result. Here then we have an elaborate structure which is useless, or worse because dangerous. Were a railway contractor to leave open a siding which he had used in the construction of the line, the train might dash into it and a fatal accident result. This is exactly what is done when this diverticulum of the small intestine is left unclosed, and the fatal accident occasionally occurs. Were further illustration necessary we might refer to the fact of disease sometimes attacking that functionless structure the rudimentary breast in the male.

The consideration of such structures as the diverticulum may be said not to take us farther than to clear the ground, showing us that we have been on the wrong path. But a survey of rudimentary structures generally carries us farther. On the hypothesis of the independent origin of species they are unintelligible, while the hypothesis of evolution furnishes a clue to the whole. The facts of embryology, of palæontology, of rudimentary as well as developed structures are harmonised, and the whole present themselves as the result of the operation of a great law, the equivalent in the organic world of the law of gravitation in the inorganic. Although we do not as yet see so well how this biological law operates, the anatomist sees enough to make him feel that he is shut up to some form or other of the theory of evolution, and that the notion which we imbibed in our early years, and have long cherished, that so-called species arose independently of each other, must be a mistake.

The slow progress which this view has made in this country compared with Germany, the author attributed partly to the teleological bias which anatomy early received among us, but mainly to the fact that anatomy has been taught in the medical schools of this country for the most part as a mass of detail in its professional application, without reference to the ideas which it suggests when more widely and profoundly studied as a science.

SCIENTIFIC SERIALS

Ocean Highways, October.—The principal article in this month's number is one by Lieut. Salaverry, of the Peruvian Navy, on the "Navigation of the Upper Amazon and its Peruvian Tributaries," in which he gives some very interesting particulars of the measures that have been adopted by the Peruvian Government to open up and encourage the flow of commerce along the great fluvial highways which connect the rich provinces of the Andes with the Atlantic. The amount of work done by the Peruvian Government during the last few years in the exploration of the region with which the article is concerned is wonderful, and we are sure quite unknown even to many of those who take an interest in geographical discovery. Captain Davis contributes a second article on the *Challenger*, which is followed by one on the Pacific Railways of the South, *i.e.* the Southern United States. Two very interesting narratives are "A Visit to the Kuh-I-Khwajah in Sistan," the place mentioned being a remarkable hill to the west of Naseribad, the chief city of Sistan; and "A Visit to Kuloja," by Mr. Ashton Wentworth Dilke, the plain of Kuloja being "a continuation of the Seven Rivers country running up between the Ala Tau and Thian-Shan Mountains."—Mr. E. G. Ravenstein contributes a paper on "Elmina, and the Dutch Gold Coast;" which is followed by an article on the *Polaris*, the usual reviews, proceedings of societies, &c. There are Maps of the former Dutch Possessions on the Gold Coast, of the Amazonas in Peru, of the Pacific Railways of the South, and a Chart of the *Challenger's* course to the Cape de Verde Islands.

Bulletin de la Société Impériale des Naturalistes de Moscou, No. 3, 1872.—In a paper on tantalum, in this number, M. Herman describes five different combinations of the metal with oxygen, two only having been hitherto known.—There are several zoological and botanical lists,—M. Becker gives an account of beetles and flies met with on a journey to the Astrachan region; Mr. M'Lachlan gives drawings of some new species of Phryganides, and a Chrysopa, found in Finland and the Caucasus; M. Hochhuth enumerates the beetles of Kien and Volhynien, &c., while M. Lindemann furnishes a report on the formation of his herbarium.—M. Lubimoff's paper on a new theory of the field of vision and magnification of optical instruments, has been elsewhere noticed in our columns.

No. 4 (1872) commences with an interesting article, with illustrations, by M. Mayewski, on evolution of the barbules of *Begonia manicata*, showing the various stages from that of simple hairs consisting only of epidermic cells.—Some strictures on M. Lubimoff's views as to the field of vision are offered by M. Bredichin, who thinks the theory neither new nor exact.—M. Hochhuth continues his list of beetles (as also in the following number), and M. Kryloff describes some geological formations in the Government of Kostroma.—Dr. Dreschler communicates an account of a collection of mathematical and physical apparatus in Dresden: and the number concludes with a table of meteorological observation in Moscow, in 1872.

SOCIETIES AND ACADEMIES

LONDON

Royal Horticultural Society, Sept. 17.—General Meeting.—Mr. Henry Little in the chair.—The Rev. M. J. Berkeley called attention to some pears, part of which were cracked and small, while the rest were perfect. They had been taken from opposite sides of the same tree, and the difference was probably caused by injury from wind when in a young state.—Mr. Bull exhibited for the first time *Odontoglossum Roezlii*, a near ally of *O. vexillarium*, and which Prof. Reichenbach suggests may be a hybrid between that species and *O. Phalænopsis*.

Oct. 1.—General Meeting.—Mr. Henry Little in the chair.—The Rev. M J. Berkeley alluded to the numerous interesting and rare species of fungi which were exhibited. *Faxillus atro-tomentosus*, sent by the Rev. W. W. Newbould from Woburn; *Russula aurata*, by Miss Hubbard, from Horsham; *Hydnum squamosum*, new to Britain, from Somerset, by Mr. Aubrey Clark; *Cortinarius orellanus*, also new to Britain, from Epping Forest, by W. G. Smith, &c. Mr. Berkeley also referred to Schwendener's theory as to the nature of lichens. Bornet had recently published an admirable paper in support of the same views. He himself, however, was not convinced of their correctness. On the contrary he believed he had seen the gonidia of *Parmelia* originating from hyphæ within the cells of some drift wood from the Arctic regions. He also read a letter from Dr. Thwaites, of Ceylon, who thought that the symmetrical growth of the lichens was an argument against one portion being parasitic on the other.

PHILADELPHIA

Academy of Natural Sciences, June 10.—Dr. Ruschenberger, president, in the chair.—Mr. Gentry made the following remarks:—At the last meeting of the Academy, Mr. Meehan made some observations upon the peculiar structure of the flowers of *Pedicularis canadensis*, observing that he had vainly watched them during two seasons with the view of determining the manner in which they were fertilised. He further said that he had noticed that they received the attention of a species of humble-bee, for the sake of their honey, which, in order to accomplish its purpose, always bored a hole into the side of the tube. On Wednesday morning last, I visited a spot where the plants were growing luxuriantly, affording an interesting field for observation. It was not long before I observed a *Bombus terrestris* to alight upon the outer side of the tube of a flower, at a distance of three feet from me. At this distance it did seem as if the bee in order to obtain the honey which it secretes, produced a slit into the tube, as Mr. Meehan observed. But the movements of the bee being so quick, and the distance too great to judge accurately, I ap-

© 1873 Nature Publishing Group

proached the insect by degrees, until I was within three inches of it, when the whole process became apparent. The bee, however, was so intent upon its labours, as not to take any notice of me. The flower is composed of an erect tube, with a natural cleft running along its lateral walls from above, through one-third its entire length, presenting outwardly apparently a mere crease, from the manner in which the compressed margins of the upper lip fit into the rolled-in edges of the lateral lobes of the under lip. The upper lip is compressed, arched, and beaked, presenting an aperture at the apex, through which passes a curved pistil, the lower lip is reflexed, consisting of three lobes, one median and two lateral, assuming a platform arrangement. Enclosed within the upper lip are four stamens, didynamous, with their anthers turning backwards, facing each other vertically. When ripe these anthers split upon the inner side, thus giving a fancied resemblance to an oval snuff-box thrown backwards upon its hinges. Each cell is filled with white pollen grains. Now when the bee alights upon the tube, by means of its trunk, it opens the natural cleft above alluded to, and having thus gained partial entrance, it would defeat its intention did not the length of the flower's tube when contrasted with that of the bee's trunk, necessitate the admission of the entire head also. In this operation the lips of the flower are pressed apart, the margins of the upper lip are separated to receive the head, and the pollen grains, already ripe, by the considerable motion to which they are subjected, become dislodged from their cells, and fall down in a dense shower upon the bee's back and head. Having obtained the coveted sweet, it flies to another flower upon a different stalk, as I observed in a score of cases during two days; but before renewing the preceding operations, stations itself awhile upon the lower lip, its head coming in contact with the stigma of the pistil. Then, by means of the hairs that line the inner side of the tarsus of each interior leg, and the constant rubbing together of the parts comprising its trophi or its instrumenta cibaria the attached pollen grains are sent flying in every direction, sure to adhere to the stigma. Whilst observing the above process, I also noticed that after the lips had been pressed apart, and were permitted to regain their position, the upper lip, being somewhat elastic, sprang back to its place with considerable force, sending through the aperture, through which passes the pistil, a complete cloud of pollen, enveloping the stigma upon every side. This operation can be performed artificially, by taking hold of the under lip with the left thumb and fore-finger, and pulling the upper lip backward, by the right, and then releasing the hold of the latter: the upper lip springs to its place, spirting the pollen through the aperture upon the left hand. From the above it is to be seen, that the plant has two chances of being fertilised—one by its own pollen, and the other by that of another. Although the flower seeds abundantly, yet I am disposed to think that it is mainly through the pollen of another that the seeds become perfect. I incline to this opinion because, in an examination of many pods, I noticed that a few seeds were found in a rudimentary condition, apparently manifesting a tendency to abort, while the majority were in a vigorous condition; the former, doubtless, being the effects of self-fertilisation in part, which, as is well-known, is a degenerating process. I desire also to call attention to an interesting discovery which I was enabled to make recently, whilst engaged in an examination of a double flower of *Ranunculus fascicularis*. In the genus Ranunculus, the corolla of a normal flower is made up of five petals, each of which on the inner side of its basal part is usually provided with a scale. This scale from its position is denominated the *nectariferous scale*. In the specimen under consideration three of these scales had assumed the character of petals, agreeing with the flower's true petals in every particular except size, being but three-fourths the dimension of the latter. It very frequently happens that we find, in examining flowers, parts which we can refer to no organ with which we have become acquainted. They appear to be distinct from any of the whorls which make up a perfect flower, although located among them and attached perhaps to them. All such parts are designated as appendages. Under this category are placed the scales that are characteristic of some species of Crowfoot. Prof. Lindley thinks that these small appendages are barren stamens united to the bases of the petals. This opinion I think is a just one. From the facts here indicated it is reasonable to conclude, that the double flowers of the Ranunculus do not always originate by true staminal metamorphosis, but sometimes by scale transformation; also that nectariferous scales when they exist are barren stamens, which favourable conditions may develop into true petals. Whilst examining several specimens of *Potentilla canadensis* lately, I was struck with the variableness displayed in the number of segments which constituted their outer or calycine whorls. This series in *Potentilla*, as is well known, consists of five sepals, with as many intermediate bractlets. In the specimens to which I refer, I counted from seven to ten bractlets. This numerical variation I am confident results from the splitting, so to speak, of some or all of the primary bractlets, as specimens were observed which exhibited all the transitional forms, from a slight indentation at the apex to partial and complete division.

PARIS

Academy of Sciences, Oct. 13.—M. de Quatrefages, president, in the chair.—The president announced the death of M. Antoine Passy.—The following papers were read:—On crystalline dissociation, by MM. Favre and Valson. This portion of the author's researches deals with the estimation of the work done in saline solutions. Tables of the value of this work were given.—Researches on the ancient fauna of the Island of Rodriguez, by M. Alph. Milne-Edwards.—Verification of Huyghens's law by means of the prismatic method, by M. Abria.—Monograph on the fishes of the family of the *Symbranchidæ*, by M. C. Dareste.—On a mechanical purifier for illuminating gas which will also serve to mix vapour with the gas, by M. D. Colladon.—Researches on the action of the so-called antiseptics on carbuncular virus, by M. C. Davaine. The author found the bodies in question were, as a rule, effective in destroying the virus.—Studies on the *Phylloxera*, continuation by M. Max Cornu.—On the oak *Phylloxera*, by M. Balbani.—Note on a new method of tempering steel, by M. H. Caron. The method consists in quenching the heated steel in heated water, the temperature varying with the size of the article. The author stated that this method augmented the elasticity considerably without altering the softness of the metal.—On the use of potassic disulphate as a means of detecting galena, by M. Jannettaz.—Meteorological observations made in a balloon, by M. G. Tissandier.—New remarks on the epidemic goitre of the St. Etienne barracks, by M. Bergeret.

CONTENTS

PAGE
LIST OF SCIENTIFIC SOCIETIES AND FIELD CLUBS 521
LOCAL SCIENTIFIC SOCIETIES, I. 523
FARADAY ON SCIENTIFIC LECTURING 524
ECKER'S CONVOLUTIONS OF THE BRAIN 526
OUR BOOK SHELF 527
LETTERS TO THE EDITOR:—
On the Equilibrium of Temperature of a Gaseous Column subjected to Gravity.—PROF. J. CLERK-MAXWELL, F.R.S. . . . 527
Mallet-Palmieri's Vesuvius.—DAVID FORBES, F.R.S. 528
Oxford Science Fellowships.—Prof. H. B. CLIFTON, F.R.S. . . 528
Harmonic Echoes.—Lord RAYLEIGH, F.R.S 528
Deep-sea Soundings and Deep-sea Thermometers.—HY. NEGRETTI and ZAMBRA. 529
Settle Caves Report.—R. H. TIDDEMANN 529
Carbon Battery Plates.—CHARLES V. WALKER, F.R.S. 529
ASTRONOMICAL ALMANACS, III. 529
THE BRIGHTON AQUARIUM. By W. SAVILLE KENT, F.Z.S. (*With Illustrations*) 531
THE RAPIDITY OF DETONATION 534
NOTES 534
ON THE FINAL STATE OF A SYSTEM OF MOLECULES IN MOTION SUBJECT TO FORCES OF ANY KIND. By Prof. J. CLERK-MAXWELL, F.R.S. 537
ORIGINAL RESEARCH AS A MEANS OF EDUCATION. By Prof. ROSCOE, F.R.S. 538
CONDUCTING POWER FOR HEAT OF CERTAIN ROCKS. By A. S. HERSCHEL, F.R.A.S. 540
THE DIVERTICULUM OF THE SMALL INTESTINE CONSIDERED AS A RUDIMENTARY STRUCTURE. By Prof. STRUTHERS, F.R.S.E. . . 540
SCIENTIFIC SERIALS 541
SOCIETIES AND ACADEMIES 541

ERRATUM.—Vol. viii. p. 519, 2nd col. last line, for "tonic" read "toxic."

© 1873 Nature Publishing Group